SM212 Differential Equations,
Fall Semester 2010-2011

Textbook: Differential Equations with Boundary Value Problems, 7th ed., by Dennis G. Zill and Michael R. Cullen. Some quizzes, hour exams and parts of the final exam will restrict access to calculators.

The syllabus and homework assignments listed below may be modified as the semester progresses. Your instructor will determine and announce these changes.

LESSON/PAGES	SECTION/TOPIC	CORE PROBLEMS
1. 2-10 and 121	1.1 Introduction to differential equations with emphasis on differential operators and linearity.	p.10:1,2,13,27,29; p. 156: 3,5,7 (do not factor)
2. 35-36, 44-50	2.1.1 Direction Fields 2.2 Separable Variables (review)	p. 41: 3,4abc. For 4b find the solution and graph it; p.50:1,6,7,17,25
3. 53-58	2.3 Linear Equations (review)	p.60:3,5,9,10, 23,27,28
4. 75-79	2.6 Euler's method (TI and excel or MatLab)	p. 79:1 and Handout 1
5. 85-87	3.1 Applications of linear models: mixing, cooling	p. 89:13, 17, 21, 25
6. 13-16, 118	1.2 and 4.1 Existence and uniqueness for general initial value and for linear initial value	p. 17: 9, 13, 25, 26; p.128: 3,9,10 and Handout 1
7.	Review	
8. 120-125	4.1 Linear independence of *k* vectors in **R**^*k*; Linear independence of *k* solutions to a *k*-th order linear homogeneous differential equation; Fundamental sets of solutions.	p. 128: 15, 16, 18, 21 (warning: if you want to use the Wronskian, you need a DE first, such as y'''=0 or y'''-y'=0, etc.), Handout 2
9. 133-138 or Handout 3	4.3 Linear homogeneous constant coefficients DE's: real roots	p. 139: 3,5,15,31,35
10. 133-138 or Handout 3	4.3 Linear homogeneous constant coefficients DE's: complex roots; complex exponential	p. 139: 9,11,25,29,43-48
11.	Review	
12.	Test 1	
13. 126-128, 152-156 or Handout 3	Non-homogeneous DE: 4.1 Superposition Principle; 4.5 Solving using the method of undetermined coefficients	p. 129:31; p. 156: 39, 47, 51, 67
14.	Review	
15.	Topics in Linear DE (annihilators, Lanchester, etc.)	
16. 182-186	5.1.1 Undamped mass-spring systems	p.194: 1,2,3,5,9,11
17. 186-189	5.1.2 Damped mass-spring systems	p.194:19,21,23,25ab;

		p217:7,8
18.189-191	5.1.3 Mass-spring systems with external force	p.194: 31,39; p.217:1,17
19.87-88, 192-193	5.1.4 Series electrical circuits	p. 194:45, 47, 53
20.	Review	
21.	Review	
22.256-258	7.1 Laplace transform	p.261:5,7,11,25,31,38
23.262-265	7.2.1. Inverse Laplace transform	p.269: 4,5,12,15,23,27,
24.265-269	7.2.2 Solving DE's using Laplace transform	p. 269: 33,36,37
25.270-274	7.3.1 First translation theorem	p. 278:5,9, 11,16, 21,29 with y(0)=2, y'(0)=3.
26.274-277	7.3.2 Unit step functions	p.278:37,40,41,49,50,55,57,61
27.274-277	7.3.2. Unit step functions in a DE	p.278:65,71,73 For all problems, evaluate the solution at t=2 and t=6.
28.	Review	
29.282-286	7.4 Derivative of a Laplace transform, convolution	p. 289:1,3,11,19,25,33
30.292-294	7.5 Dirac delta function	p. 295:1,3,9,11
31.295-297	7.6 Solving systems of DE using Laplace transform	p. 299: 1,3, 14
32.	Review	
33.	Test 2	
34.App3-10	Appendix II.1 Matrices	p.App18:1,3,4,7,11,15,25
35.App10-14	Appendix II.2 Solving linear systems by row reduction	p. App18:31,35,39
36.App10-14	Appendix II.2 Matrix inverse by row reduction	p.App18: 41,45
37.App14-18	Appendix II.3 Cramer's rule, eigenvalues	p.App18: 47, 49, 53, 54
38.	Review	
39.304-310	8.1 Systems of differential equations	p.310:1,11,1317,21
40.311-315	8.2.1 Systems of DE with real eigenvalues	p. 324: 1,3,5,7
41.320-324	8.2.2 Systems of DE with complex eigenvalues	p. 324: 33,35,37,39
42.329-332	8.3.2 Nonhomogeneous systems by variation of parameters	p.332: 11,13,15, 29
43.109-110, 297-298	3.3, 7.6 Electrical networks	p.299: 15, 16 (use Laplace for this one); p.332:33
44.353-355	9.4 Euler's method for linear systems and higher order DEs	p. 1,9 (use Euler's method with h=0.1)
45.	Review	
46.	Test 3	
47.433-435	12.1 Separation of variables for partial differential equations; formulation of	p.436: 2,3; p. 445:8 with L=2. Also, sketch the solution

	the BVP for heat equation, solving when the initial condition is a linear combination of sines	at x=0.4, as a function of time
48.398-402	11.1 Orthogonal functions;	p.402: 1,11,12, 21abe, 17 (bonus)
49.403-405	11.2 Fourier series, sequence of partial sums (S_k)	p.407:1,3,5,7 For problem 3, 7: also sketch S_3, evaluate $S_3(0.4)$ and f(0.4)
50.405-407	11.2 Convergence of Fourier series: clarify miss- stated theorem 11.2.1; comment on Gibbs effect and JPEG images	p.407: sketch the sum of the FS for 3,7.
51.408-411	11.3 Sine and cosine series	p.414:1,3,5,7,11,13,25,29. For the last two problems, also sketch the sum of each series on the intervals, [-2,2] and [-pi, pi], respectively
52.443-444	12.3 Heat equation, zero ends	p. 445:1,6
53.443-444	13.3 Heat equation, insulated ends	p. 445: 3,5
54.	Review	
55.	Exam 4	
56.	Topics in DEs and Review for the final exam	
57.	Review for the final exam	

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